



Contribution ID: 963

Type: **Invited talk in the parallel session**

## The Great Dimming of Betelgeuse as viewed by high-resolution spectra from the Stratosphere, and ground based TiO Photometry

*Thursday, 8 July 2021 17:25 (20 minutes)*

NASA-DLR's Stratospheric Observatory for Infrared Astronomy (SOFIA) observed Betelgeuse during the 2019/2020 Great V-Band Dimming event. High spectral resolution emission-line spectra were obtained with EXES at [Fe II] 25.99 microns and [S I] 25.25 microns before and during the event, and with upGREAT at [O I] 63.2 microns and [C II] 157.5 microns shortly after minimum. The line fluxes and profiles revealed that the circumstellar envelope was essentially unchanged in February/March 2020.

An analysis of ground-based TiO photometry revealed that the mean photospheric temperature had dropped significantly, to a record low, and that it correlated strongly with the photospheric radial velocity. ESO Very Large Telescope-SPHERE images also revealed a non-uniform photosphere during the Great Dimming. A cool multi-component photosphere can explain the multi-band photometry, and it is not necessary to invoke dust as an explanation for the Great V-band Dimming. This does not, however, exclude the possibility that some dust formed during this dynamic event.

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**Session Classification:** The "Fall and Rise" of Betelgeuse

**Track Classification:** History of Relativity: The "Fall and Rise" of Betelgeuse